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ABSTRACT

The educational and pyschological effects of the practice of Transcendental Meditation (TM) on secondary school students were examined. A course including TM technique was taught to two public high school classes of 30 volunteers each. One class took the TM course for both semesters; the other took an alternative course in self-development for the first semester and the TM course for the second semester. A group of volunteers from the same school formed the control group. Personality, intelligence, and interview measures were administered on a pretest-posttest basis to all three groups. The year-long TM class showed significant global effects of treatment on neuroticism (as measured by the Eysenck Personality Inventory), self-concept (as measured by the Tennessee Self-Concept Scale), and the interview measure. Regularity of the TM technique correlated with gains in both experimental groups. (Author)

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THE TRANSCENDENTAL MEDITATION TECHNIQUE IN SECONDARY EDUCATION

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Abstract

Susan Levin

The research examined the educational and psychological effects of an academic course for secondary education students which includes the practice of the Transcendental Meditation technique.

Three groups of students participated in the experiment: 1) those who took the course which included TM for the entire school year; 2) those who took a psychology self-development course for the first semester, then changed to the TM class for the second semester; 3) those serving as the control group, receiving no self-improvement instruction.

The students taking the course which included TM were instructed in the technique by a trained TM teacher, who was not the classroom teacher of either course. The students were asked to meditate twice daily, one of these periods being provided during the first fifteen minutes of the TM class. The academic material of the course included a study of qualities associated with creativity and intelligence (e.g., spontaneity, precision, stability, adaptability), and their expression in the lives of the students, in the natural environment, and in the lives of great people.

The self-development course taken by the second group for the first semester included the use of games, plays, art projects, discussions

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and writing assignments designed to enhance awareness and acceptance of self and others. The same teacher taught both classes five times per week, each class lasting for one class period.

All groups were pretested in September and posttested in January and June. The psychological measuring instruments used were the Tennessee Self-Concept Scale, Eysenck Personality Inventory, California Short-Form Test of Mental Maturity, and individual interviews measuring self-perception of personal effectiveness and self-perception of change in several areas of life.

Significant differences between groups were found on neuroticism, self-concept, and perceived change. The TM class was found to be lower on neuroticism and higher on self-concept and perceived change measures than the other two groups. A significant difference between January and June testing was found on self-concept, the TM class showing the greatest gain; and a significant interaction effect between test-time and group differences on perceived change was found, the TM class showing the greatest gain. Changes in self-concept were found to be negatively correlated with changes in neuroticism.

Regularity of meditation was found to be positively correlated with gains in the TM class on perceived change, and with gains in the Psych/TM class on self-concept and perceived effectiveness.

The usefulness of a widely applicable psychophysiological technique which relieves stress and improves the functional efficiency of the

nervous system can be considered potentially valuable for improving the efficiency of the educational process. The decrease in neuroticism and improvements in self-concept and perceived positive changes in student experiences at school, at home, and in interpersonal relationships found in the study suggest that the student practicing the TM technique becomes more comfortable with himself and others, more alert, and more receptive to the educational environment.

As a means of simultaneously developing affective and cognitive abilities, the TM technique, in the context of the course through which it is offered, bears further investigation in secondary education.

Subsequent chapters review previous research on the Transcendental Meditation program; offer an explanation of meditation and its effects in philosophical, psychological, and psychobiological terms; and discuss implications of the TM technique for the future of education and for society.

For my parents, with love and gratitude.

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THE TRANSCENDENTAL MEDITATION TECHNIQUE IN SECONDARY EDUCATION

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An academic course for secondary education, which includes the practice of the Transcendental Meditation technique (TM), was taught to two public high school classes of 30 tenth, eleventh, and twelfth grade volunteers. One class was taught the TM class for both semesters; the other was given an alternate course in self-development for the first semester and the TM class for the second semester. A control group was formed from volunteers from the same school and grades. The Tennessee Self-Concept Scale, Eysenck Personality Inventory, California Short-Form Test of Mental Maturity, and individual interviews measuring self-perceived effectiveness and change in different areas of life were administered as pretests in September and posttests in January and June to all three groups. The year-long TM class showed significant global effects of treatment on neuroticism, self-concept, and perceived change ($p < .01$). Regularity of meditation was found correlated with gains in both experimental groups. The potential value of a widely applicable techaique which simultaneously affects cognitive and affective development is discussed.

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The effects of the Transcendental Meditation technique on physiological and psychological development have been studied scientifically in the past few years. It is considered by its advocates to be an effective means for developing individual potential.

Transcendental Meditation is described as an effortless mental technique for experiencing a thought at successively earlier (primitive) stages of development. The procedure involves two elements, the type of thought that is used, and the method to experience the thought. The individual is given a "mantra," one of a set of sounds believed traditionally to have positive effects on the human nervous system. The sound is selected according to a procedure followed by a trained instructor who is himself a meditator and has been personally trained by Maharishi Mahesh Yogi. (Maharishi Mahesh Yogi originally introduced the technique to the United States.) The individual learns to use the sound properly so that it is spontaneously experienced at less and less active levels of the thinking process.

The technique is called Transcendental Meditation because it is claimed that in the process of the meditation one goes beyond, or transcends the most subtle level of thought and experiences an absence of thought and feeling along with inner awareness--a state called pure consciousness.

Corresponding to the quieting of mental activity experienced during the practice, the body experiences deep relaxation (Wallace, Benson & Wilson, 1971; Corey, 1975).

Subjective reports from individuals who regularly practice TM include improved clarity of thinking, less physical and mental stress,

enriched perception, greater efficiency and effectiveness in life and more harmonious inter-personal relationships.

The TM technique is taught systematically in a program involving approximately eight hours total time. After initial instruction the individual is considered self-sufficient in the practice, directed to meditate for 15-20 minutes twice a day. It is seemingly adaptable for use in public schools because it is easily learned; non-religious; requires no special environment; may be practiced sitting in a chair; is not dependent on the TM instructor after it is learned; and is applicable to any student who wants to learn it, irrespective of intellectual abilities or attitude toward the technique. The TM technique is the practical part of an academic course developed for secondary education called the Science of Creative Intelligence (SCI)(1974).

Though the subjective experience of TM is not open to scientific analysis, its effects on brain and body functioning, personality, and behavior are measurable. Investigation of these effects have been in two broad areas, the physiological effects occuring during the practice, and the cumulative physiological and psychological effects outside of meditation that result from consistent practice of the technique.

Physiological experiments on meditators have shown that during TM the body is in a state of deep relaxation while brain wave activity becomes more orderly and synchronous (Banquet, 1972, 1973). Wallace (1970) has hypothesized that TM produces a fourth major state of consciousness, uniquely different from waking, dreaming, and sleep states. It is the cumulative effect on the nervous system of this "restfully alert" state that is theorized to account for the global effects attributed to TM (MIU, 1975).

Psychological studies have included investigation of the effect of the TM technique on intelligence, learning, and personality development. In many of the studies amount of improvement is related to regularity of the practice and length of time meditating, suggesting the cumulative effects of the technique.

Tjoa (1975) found a group of meditating high school students to increase in intelligence compared to non-meditators, using a Dutch adaptation of the Differential Aptitude test designed to measure fluid intelligence. In a later study (1975) he found regularly meditating college students to increase more in intelligence and decrease more in neuroticism and somatic neurotic instability than irregular and non-meditators.

Shecter (1975) found greater improvement in two groups of high school students practicing TM for fourteen weeks compared to non-meditators on creativity (Match Problems Test); intellectual performance (Raven Progressive Matrices); anxiety (Attitudes Toward Specific Situations Test); and the personality variables complexity, conformity, energy level, innovation, self-esteem, and tolerance (Jackson Personality Inventory).

Improvement in intelligence test performance may be the result of a combination of effects brought about by TM. Sarason and Mandler (1952) and Zweibelson (1956) found anxiety to be detrimental to test performance, specifically to intelligence test performance. By reducing anxiety (see below) TM may have the opposite effect.

Cattell (1963) has written that fluid intelligence, which he defines as the adaptable "ability to perceive relations and educe

correlates (p. 6)," varies as a function of transitory changes in physiological efficiency. He contrasts fluid intelligence with crystallized intelligence which varies "more as a function of interest and practice than as a function of physiological well-being (p. 7)." He states that decrease in physiological efficiency caused by fatigue, emotional reactivity, or stress "can inhibit the full deployment of fluid intelligence (p. 8)." TM research findings on brain wave activity (Banquet, 1972, 1973), on the response of the autonomic nervous system to stress (Orme-Johnson, 1973), and on perceptual-motor coordination (Pelletier, 1974; Appelle & Oswald, 1974; Blasdell, 1975) suggest that TM brings about cumulatively positive changes in physiological efficiency, which could possibly lead to increasing use of one's fluid intelligence.

Kory and Hufnagel (1975) reported reduction in anxiety and improvement in grade point average in two classes taking a course which included the TM technique. (The Science of Creative Intelligence (1974), which includes TM, is the course developed by Maharishi International University for secondary education.) These two groups were compared to two psychology classes used as controls. Collier (1973) and Heaton and Orme-Johnson (1975) found grade point average in groups of college students to increase, continuing to improve as the students continued to meditate.

In studies on the effects of TM on learning, Miskiman (1975) randomly divided prospective meditators into two groups, one which began TM immediately and one which was asked to delay starting in order to serve as a control group. Posttesting showed meditators to have better secondary organization as measured by the Index of Clustering.

Miskiman also found meditators to learn quicker and make fewer errors per trial on a maze-learning task. Abrams (1975) found experienced meditators to perform better than beginning meditators and non-meditators on tests measuring acquisition and recall. The TM group may have been more highly motivated in these studies, so it is difficult to determine whether better performance was due to affective or cognitive factors or both.

On anxiety and personality measures, regular meditators improved more than beginning and irregular meditators on the IPAT Anxiety Scale (Lazar, Farwell & Farrow, 1975); more than an alternate treatment group on the State-Trait Anxiety Inventory (Nidich, Seeman & Seibert, 1975); and more than an alternate treatment group and non-meditators on Speilberger's State-Trait Anxiety Inventory (Davies, 1975; Stern, 1975; Shapiro, 1975). Experienced transcendental meditators (averaging twenty-two months) were found to be less anxious and more internally controlled than beginning meditators on Bendig's Anxiety Scale and Rotter's Locus of Control (Hjelle, 1974). In a two and one-half year study with mental patients, Candelent and Candelent (1975) found a general lessening of anxiety among the meditating group, diminished overactive and impulsive behavior, and some alteration in sleeping habits. They found no particular diagnostic group more or less suited to TM.

Individuals practicing TM showed improvement in the direction of self-actualization on Shostrom's Personal Orientation Inventory (POI) compared to non-meditators (Nidich, Seeman & Dreskin, 1973); compared to a group who received counseling (Dick and Ragland, 1975); and compared

to a group receiving an alternate relaxation program (Davies, 1975). Meditating college students scored higher than the college student norm on eight of the twelve POI scales and as high as a group clinically judged to be highly self-actualized on seven of the twelve POI scales (Orme-Johnson & Duck, 1975). When the POI was administered to three groups differentially interested in beginning TM the level of interest was not found to be correlated with their degree of self-actualization (Stek and Bass, 1974). This could imply that changes on this measure are due more to treatment effect than to predisposition of the individuals taking TM.

Further evidence of improvements due to treatment effect rather than predisposition of subjects to improve is provided by Otis (1974) who intentionally selected subjects at Stanford University who were not particularly interested in TM, and divided them between treatment and control groups. On posttesting he found the TM group significantly higher in enjoyment of life, restfulness of sleep, happiness, energy level, sexual adjustment, level of fatigue and creativity. He also found from a questionnaire sent to a random sample of people who had learned to meditate that those who had stopped meditating had a more negative self-image and were more withdrawn and irritable than those who continued. This finding suggests that the difference in test performances between beginning and long-term meditators may be due in part to distinctive personality characteristics of the long-term meditators which may or may not be the result of the TM technique.

Transcendental Meditators increased in self-actualization on the Northridge Developmental Scale (Ferguson and Gowan, 1974; Shapiro, 1975),

the changes found to be uncorrelated to the subjects' expectations as indicated on a questionnaire prior to beginning TM.

Experienced meditators (twenty-four months) differed more from a normative group than short-term meditators on the Frieburger Personality Inventory, a measure of psychological health (Fehr, Nerstheimer & Torber, 1975). Penner, Zingle, Dyck and Truch (1973) compared a group of subjects before and twenty-two days after beginning TM to a normative sample (NS) on the Omnibus Personality Inventory. They found the TM group less tense and anxious than the NS before and even more relaxed afterwards; less prone to act out feelings afterwards; higher than NS afterwards on thinking introversion, personality integration, and response bias; and different from NS at the start (no change in post-test) on being more imaginative, free-thinking, intellectually oriented, feminine, and considerate.

Eight-week meditators differed from control groups on the Personality Research Form in the direction of effective psychosocial functioning (Schilling, 1975). Long-term meditators scored higher than beginning meditators on the three scales of the Torrance Test of Creative Thinking--Fluency, Flexibility, and Originality (MacCallum, 1975). However Otis (1974) reports a study in which meditators were found to score no higher than non-meditators on a creativity measure.

Meditators showed significant improvement on the Autokinetic Test, Embedded Figures Test, and the Rod and Frame Test (Pelletier, 1974). These results were interpreted to show change in attention deployment and thus perceptual style in the direction of increased perceptual acuity, increased ego-distance, and increased field

independence with healthy perception of self; relevant evaluation of the environment; autonomy; and a functioning of intelligence involving analytical competence, isolating essential components and recombining them in new relationships. Perceptual style is said not to be susceptible to conscious control. Therefore change in perceptual style is interpreted to mean spontaneous alteration in the ability to focus attention on a significant stimulus rather than on distracting background stimuli. This result could lead to improved functioning of the individual in the classroom environment, and may account in part for the improved academic performance found in meditators (noted previously).

Using questionnaire and interview measures, Frew (1974) found the practice of TM related to increased productivity, job satisfaction, and improved relations with supervisors and co-workers. Kuna (1975) found TM to have positive effects on work adjustment and performance. According to his findings TM lowers anxiety; improves attention and the discriminative capacity related to decision making; and enhances learning efficiency.

Other cumulative effects of TM have been reported in the areas of health (Benson & Wallace, 1972; Hornsberger and Wilson, 1973); athletics (Reddy, Bai & Rao, 1975); drug abuse (Gelhorn, 1971; Winquist, 1969; Shafii, Lavely & Jaffe, 1974); and rehabilitation of prisoners (Cunningham & Koch, 1975; Orme-Johnson, Kiehlbauch, Moore & Bristol, 1975).

Considerations for designing TM research for secondary education

Evaluating psychological measurements on effects of a particular self-development treatment is often confounded by the predisposition

of participants to improve. It is difficult to isolate treatment effect from effects brought about by the interaction between individuals looking for improvement in their lives and any treatment which purports to do this.

This problem could be minimized by the comparison of TM with another self-development class, both of which are formed from volunteers for the same class. Ideally the design would include the random assignment of students to two self-development treatments and a control group from the same large group of volunteers, all equally interested in participating in a self-development program or none of whom are interested. This would control for differences in attitude or motivation toward improvement between groups.

Another consideration in interpreting research findings is the "selectness" of some of the experimental groups. Meditators willing to participate in research may constitute a specialized group because 1) they began meditation; 2) they continued meditation (reportedly, many people do not continue, though there are no available statistics); 3) they volunteered for testing on TM. The quality, extent, and rapidity of positive affective changes may be due in part to these factors. The physiological findings, however, as well as findings on prisoners, patients, drug users and other individuals who approached TM as they did many therapies, with neutrality or skepticism, suggest that TM's effects may be generalized to all individuals who regularly meditate. Thus there is the problem of how extensively one can generalize from the results.

The tendency for individuals to respond favorably to anything new which is intended for their benefit (Thorndike, 1963) may account in part for positive results in TM research; yet Bauernfeind and Olson (1973) present contrary evidence to a Hawthorne effect in educational experiments among elementary school students. Further evidence is needed on the experimental situations in secondary education which elicit a Hawthorne Effect. To control for the possibility, two equally "special" courses could be offered, each outside the usual curriculum. The research should be conducted over a sufficiently long period to allow for the impact of novelty, which is said to account for the Hawthorne Effect (Bauernfeind and Olson, 1973), to wear off. A study over several months can be expected to reduce or eliminate responses based on suggestion or short-lived attachment.

In attempting to isolate treatment effects, the SCI course could be compared to another course which involves the same amount of individual attention, since the amount of personal attention from the teacher has been shown to affect student motivation and performance (Jeter, 1973).

In research which involves a daily class, the teacher becomes an important variable. He/she can affect attitudes, motivation, and performance of the students (Jeter, 1973). One way to control for different effects from different teachers is to have the same teacher, if equally competent in both areas, to teach both self-development courses. Another approach is to have the classes taught by two equally enthusiastic (or equally bored) teachers, each competent in one of the two areas.

Comparing the effects of two self-development classes also allows for the possibility that a particular personality "type" (intellectually or emotionally distinctive) tends to volunteer for a meditation course. If participants in both classes are drawn from the same group of volunteers, differences found between the groups can more reliably be assigned to treatment effects rather than an interaction between a certain personality "type" and the treatment.

In a school situation in which the students are finally assigned to classes by the guidance counselors, the group taking the meditation course may be uniquely responsive to that treatment, even if participants in both self-development classes are drawn from the same group of volunteers. If the non-meditation course switches to the meditation course in mid-year, comparisons between the two meditation classes could be made.

Regularity of meditation has been shown to be an important variable in TM research. Ensuring regular practice of the technique, twice a day, is a challenge in a public shcool setting. Ideally participation in the class would include required attendance at both meditation periods, morning and afternoon. Otherwise records can be kept by the student on his meditation practice outside of class. One of the fifteen-minute periods can be structured as the first part of the daily SCI class.

Length of meditation (number of weeks or months) has also proven to be a significant variable, several studies indicating that the effects of TM are cumulative. Otis (1974) found that individuals discontinuing to practice TM stop after six to eight months on an average. It may

be that changes resulting from the practice do not follow a linear trend, but taper off or accelerate after a given time. The possibility of linear or quadratic effects could be investigated by having more than one posttest time. TM research in a high school could also include comparative data on those who continued and those who dropped the course.

Aim of the present study

Previous research suggests the possibility that the TM technique develops a restful and alert neurophysiological state which is reflected in cumulatively increasing functional integration and effectiveness in action and behavior. If it is found practical for high school students in a public school setting and can produce results comparable to those found in a more carefully controlled laboratory setting, then it may have a significant part to play in future education.

Little research on the effects of TM in secondary education has been done to date; and it has not generally controlled for problems of self-selection or Hawthorne Effect. The nature of the course requires volunteers; but with the limitations on generalizing that volunteer experimental and control groups provide, the study was undertaken in a public school setting to determine the effectiveness of the TM technique in the context of a high school course offered as an elective in the secondary school curriculum.

METHOD

Subjects

The subjects were eighty-three public high school students in tenth to twelfth grades from a lower-middle class socio-economic environment. They were volunteers who responded to introductory lectures on SCI or to a brief written description of the course which was distributed by guidance personnel of their school. The control group responded to a ten-minute introduction describing their participation in research which was to study the effects of different types of classes. The control group was comprised of volunteers from four sections of the required U.S. History class. None of the subjects had previously taken SCI or the TM program.

Design

Sixty volunteers for the SCI class were divided into two groups by their counselors. They were assigned primarily at random but partly according to their time preference or class schedules. One group took SCI for the entire year, and one group took a psychology course for the first semester and SCI for the second semester. Both classes met every school day afternoon for the standard fifty minute period. A third group, the control group participated only in the testing.

All subjects were pre-tested at the beginning of the school year; the SCI/SCI and Psych/SCI students were pretested before the commencement of actual class instruction. In January all subjects were retested before the Psych/SCI class began instruction in SCI. In June all subjects were re-tested.

Analysis of covariance was used because assignment to the control group was not entirely by random. It also appeared to be a more powerful test for controlling initial individual differences in scores.

Instructional Treatment

The system for instructing the SCI class in TM included two introductory lectures, a personal interview, instruction by a qualified TM teacher, and three meetings in which the TM teacher verified through lecture and discussion that the technique was being practiced properly. With the exception of individualized instruction in the actual technique, which was given at the local TM teaching center, the learning steps were part of classroom activity. The TM teacher was present at these first few class meetings and once during each semester to check the students' meditations.

After TM instruction the students were directed to meditate fifteen minutes twice a day. One of the meditation periods was the first fifteen minutes of the daily SCI class. A room was provided for meditation in the morning before the first scheduled class period, but attendance was not required.

The remainder of the SCI class period centered around the academic material of the SCI course, a study of the "qualities of creative intelligence." Part of a three-year curriculum, the first year includes identification of descriptive qualities believed to be associated with creativity and intelligence (e.g. orderliness, spontaneity, adaptability, strength). It is intended that through discussion, essays, research projects, and artistic and musical expressions that the

students become increasingly aware of these qualities in their own lives, in the natural environment, and in the lives of great individuals (MIU, 1974). The students also are intended to observe the growth and development of the qualities in their lives.

The psychology course consisted of a study of the scientific approach to the study of human behavior, the use of student-devised experiments, and games, group activities, plays, discussions, and art and writing projects designed to enhance awareness and acceptance of self and others. The same teacher taught both the SCI/SCI and Psych/SCI classes. He was selected because of previous experience teaching both types of classes.

Measures

1. The Eysenck Personality Inventory (EPI) (Eysenck, 1968) gives two primary scales, Extroversion/Introversion and Neuroticism/Stability. These factors are said to be two independent dimensions accounting for most of the variance in personality. The Neuroticism scale is considered effective as a measure of the presence of pervasive anxiety (Cline, 1972). Mandler and Sarason (1952) have found anxiety detrimental to test performance; Mowrer (1950) found anxiety reduction correlated with learning; and Meyers and Martin (1974) have found state anxiety (characterized by a feeling of apprehension and heightened autonomic nervous system activity) detrimental to concept learning. Cattell (1961) has identified anxiety as part but not all of neuroticism, neuroticism being identified as a broader and more complex concept involving chronic fatigue, lowered coordination, inability to cope with behavioral problems, inability to concentrate on immediate stimuli, high motor

rigidity, and an organismic failure to achieve integration. It was expected, on the basis of previous TM research findings on autonomic stability (Orme-Johnson, 1973), field-independence (Pelletier, 1974) personality development (Hjelle, 1974), anxiety (Kory & Hufnagel, 1975) and metabolism (Wallace & Benson, 1972) that neuroticism would decrease in the SCI groups.

Extroversion was not expected to increase. Observation of regular meditators has shown a tendency to become less extreme in both extroversion and introversion. Change on this dimension was expected to be in the direction of the norm for the SCI groups.

The EPI was considered appropriate for the study because it is short, self-administered, and easily comprehensible.

2. The Tennessee Self-Concept Scale (TCSC) (Fitts, 1965), Counseling form, is a self-administered instrument which consists of 100 self-descriptive statements, divided in categories of identity, self-satisfaction, behavior, physical self, personal self, family self, and social self. A total P-score is derived from these, reflecting the overall level of self-esteem. Self-concept is thought to be central to man's behavior (Freud, 1950; Rogers, 1951; Sullivan, 1953; Maslow, 1954; Perls, 1969). The Coleman report (1966) identified it as one of the best predictors of educational achievement. A positive relationship between self-concept and academic achievement has been found by Williams & Cole (1974), Caplin (1969), and Prendergast (1970). The TCSC was used to measure changes in a psychology class structured similarly to the one in this study, and showed positive changes (Sarkisian, 1974).
TM research findings showing positive changes in self-esteem among high

school students (Shecter, 1975) as well as studies on personality development and self-actualization (Fehr, 1975; Ferguson & Gowan, 1975) led to the expectation that both the SCI/SCI class and Psych/SCI class would gain in positive self-concept. The TCSC was considered appropriate because of its brevity and because it overlaps with other widely used measures, the Taylor Anxiety Scale and the Minnesota Multi-phasic Personality Inventory (Bentler, 1972).

3. Individual private interviews of all subjects were conducted by interviewers who were not familiar with the students, the groups they were in, or the details of the study. Interviewers were trained prior to the first testing time, and all read the same instructions and questions to the subjects (see Appendix B). These covered the areas of school, family, friends, talents, health, values, and world-view. In each area the students were asked about how they felt, and if they felt they had changed in that area in the last few months. None of the classes or TM was mentioned by the interviewer. After the twenty minute interview, the interviewer alone recorded impressions of the physical presence and emotional tone of the student. The same format was followed precisely for all three testing periods.

To identify themselves, the students gave first name and last initial. The tapes were later rated by two people separately, each of whom rated all interviews, the average of the two scores later taken to yield the final rating of each sub-scale. The two parameters derived from the interview were self-perception of effectiveness and self-perception of change. A Likert scale was used for assigning scores to each of the subscales representing the different areas of student

life. The raters did not know the interviewers, the students, the nature of the research, or at which testing time the interviews were made.

This instrument was developed for reflecting possible holistic growth experienced in several areas of life as the result of the SCI course. It was felt that if the experimental time was too short for change to be reflected in the other measures, that growth effects might be reflected with the use of the individual interview.

The development and use of the measure was guided by previous research on interview techniques. Students were introduced to the interviewers and told what to expect before they were interviewed; it has been found that students are more comfortable when the interview conforms to expectancy (Pope, Blass, Cheek & Siegman, 1970). The interviewers briefly told about themselves (Vondracek, 1970). They gave detailed instructions and asked many questions in specific areas rather than general questions (Doster, 1972); maintained a close distance with good eye contact but no physical contact (Jourard and Friedman, 1970); reacted as peers, did not interpret, lead on, or deny a problem, but attempted to reflect the responses of the student non-judgementally (Pazandak, 1970); gave positive reinforcement for the rapport established (nodding, "yes," "uh-huh"); and evaluated emotional tone apart from content once the student had departed (Schwartz and Ohlsen, 1968).

The interviewers practiced on high school students from another school, and at that time revisions were made on the interview questions and suggestions made on the interviewers' style. Confidentiality was

assured; the students were told that no one connected with the school would hear the tapes, and that the tapes would later be erased.

4. The California Short-Form Test of Mental Maturity was selected because it has both verbal and non-verbal sections, a form for high school students, provides I.Q. values, and can be group-administered in one class period. Preliminary research gives some indication that the regular practice of TM improves the use of one's intelligence (Tjoa, 1975; Shecter, 1975; Orme-Johnson, 1975). Due to improved neurophysiological efficiency which TM has been shown to bring about (Banquet, 1972, 1973; Orme-Johnson, 1973; Pelletier, 1974; Blasdell, 1975), positive changes were expected on intelligence in the SCI/SCI class. No significant changes were expected on intelligence in the Psychology class; and a one-semester SCI class was considered too short for significant change to be reflected on this instrument.

RESULTS

Table 1 (Appendix A) shows the unadjusted group means for experimental and control groups on all measures. The multivariate analysis of variance tests for initial group differences (alpha = .1) was significant ($F_{12, 58} = 6.7$). The univariate tests on each of the measures (alpha = .1) indicated the following differences: 1) The SCI/SCI and control groups were higher on extroversion than Psych/SCI ($p < .06$); and 2) SCI/SCI was higher in I.Q. than the other two groups ($p < .06$). However I.Q. scores were found to be uncorrelated with gain scores (all r's between +.15 and -.15) except on the measure of self-concept for the first posttest ($r = .31$, $p < .01$). Thus covariance for I.Q. was judged unnecessary.

An intercorrelation matrix was computed to examine whether individual measures were independent of each other. The intercorrelation between neuroticism and self-concept was -.63. This result, along with a .46 intercorrelation between perceived effectiveness and perceived change, were the only intercorrelations between the measures above .30.

The first step in the analysis was multivariate analysis of covariance of all measures (using Rao's F approximation), with the six pretest scores used as co-variates (adjusted means in Table 2, Appendix A). Significance tests for between groups differences, differences between January and June testing, and interaction testing for variation in differences between groups between January and June were made (alpha = .01) (Table 3, Appendix A). The between groups difference was significant ($F_{12,109} = 3.92$, $p < .01$), indicating the mean vectors of the groups differed. The differences between January and June testing were not significant. The interaction testing for variation in groups differences between January and June was not significant.

Since the multivariate test for group differences was significant, examination of the univariate analysis of covariance was done, again using the pretest scores as covariates. Analysis of covariance (alpha = .01) was used to examine for 1) between groups differences; 2) differences between January and June testing; 3) interaction showing variation in groups differences between January and June (Table 4, Appendix A).

Where significant between group differences were found, Scheffé post-hoc comparisons were used (alpha = .01). (See Table 5, Appendix A for 99% confidence intervals of significant differences.)

Overall significant difference between groups was found on neuroticism ($F_{2,109} = 7.6$). Scheffé post-hoc comparisons showed SCI/SCI significantly lower than control; SCI/SCI lower than control and Psych/SCI combined. There was no significant differences found between January and June testing, or variation in group differences between January and June.

On self-concept there was an overall significant difference between groups ($F_{2,109} = 9.7$, $p < .01$) and a significant difference between January and June testing ($F_{1,109} = 9.12$, $p < .01$). Scheffé post-hoc comparisons showed 1) SCI/SCI greater than control; SCI/SCI greater than Psych/SCI; 2) SCI/SCI greater than control and Psych/SCI combined ($p < .01$). On differences between January and June testing the June scores were higher ($p < .01$).

On perceived change there was an overall significant difference between groups $F_{2,109} = 19.94$, $p < .01$), and a significant interaction effect showing variation in group differences between January and June ($F_{2,109} = 3.78$, $p < .01$). Scheffé post-hoc analysis showed 1) SCI/SCI greater than control; 2) SCI/SCI greater than Psych/SCI; and 3) SCI/SCI greater than control and Psych/SCI combined ($p < .01$).

The overall inter-rater correlation on the perceived effectiveness measure was $r = .90$; on perceived change, $r = .94$.

No significant sources of variance were found on extroversion, perceived effectiveness, or intelligence. Omega squared (ω^2), the proportion of variance accounted for, indicated the strongest group effects to be on perceived change (.24), self-concept (.11), and neuroticism (.10).

The lack of significant variation found in differences between groups between January and June indicates that the psychology course and SCI course did not have measurably different effects.

Regularity of meditation

A T-test between means ($T_{16} = 2.99$) showed a significant difference in regularity of meditation ($p < .05$) between the SCI/SCI and Psych/SCI groups, the SCI/SCI group meditating more regularly. A correlational analysis found number of meditations per week (an indication of the regularity of the practice) correlated with gain scores in the SCI/SCI group on perceived change ($r = .66$); and in the Psych/SCI group (during the SCI semester) on self-concept ($r = .38$) and perceived effectiveness ($r = .45$). The sub-group of regular meditators in the Psych/SCI group showed significant gains in self-concept ($p < .05$).

Student responses to teacher and classes

A questionnaire distributed to students of both experimental classes at the end of the school year asked them to rate the teacher in comparison to other teachers they had, and to rate the class material (not including the practice of TM) in comparison to other classes. In both classes the teacher was considered average (SCI/SCI; mean = 3.1, s.d. = .61; Psych/SCI: mean = 3.2, s.d. = .53) on a Likert scale of 5, and the SCI class material considered average (mean = 3.2, s.d. = .78). The Psychology semester class material was considered above average (mean = 3.8, s.d. = 1.1).

Reduction of original sample size

Out of the 31 students assigned to the SCI/SCI course, 18 completed the first semester, 14 completed both semesters. Out of the 29 students assigned to the Psych/SCI course, 20 completed the first semester, 18 completed both semesters. No significant differences ($p < .05$) were found on any measure on the pretest between drop-outs of the two experimental groups and those who completed the course.

The SCI class was reduced from 31 to 18 students within the first two weeks. The class was offered during the last and optional period of the school day during which students may participate in extra-curricular activities or go home. According to interviews of the students who dropped from the class, the unexpected academic orientation of the class precipitated most of the initial drop in enrollment. The students were expecting more meditation and exotic activities; less study, discussion, and writing assignments. The reduction from 18 to 14 from first to second semester was attributed to graduation and discontinued interest.

The initial Psych/SCI enrollment of 29 decreased to 20: six students were transferred to another school and three dropped from the class due to disinterest, also within the first two weeks. The second semester drop in enrollment from 20 to 18 was due to graduation of one student, and family disapproval of the SCI course in the case of the other student.

There were 7 boys and 7 girls in the final SCI/SCI class; 10 boys and 8 girls in the final Psych/SCI class; and 2 boys and 21 girls in the control group.

DISCUSSION

Extroversion

As expected, no change occurred on the extroversion dimension of the EPI. The SCI/SCI mean scores (Sept: mean = 13.6, s.d. = 2.89; Jan: mean = 13.3, s.d. = 3.25; June: mean = 13.7, s.d. = 3.43) and Psych/SCI mean scores (Sept: mean = 13.0, s.d. = 2.56; Jan: mean = 14.0, s.d. = 3.09; June: mean = 14.2, s.d. = 2.88) for all three testing periods averaged slightly above the American college student norms (mean = 13.1; s.d. = 4.1). According to the test authors (Eysenck, 1968), individuals scoring high on the Extroversion scale tend to be outgoing, impulsive, uninhibited, having many social contacts, and frequently taking part in group activities.

The TM program is intended to "normalize," in effect remove obstructions which hinder growth and restore greater functional integration to the nervous system. Any element of the personality which has become inflexible due to stress--whether associated with extroversion or introversion--may be expected to diminish as neurophysiological stability and flexibility increases (Reich, 1948; Brown, 1974). Therefore, change on Extroversion/Introversion as a result of TM would be expected to be in the direction of the normative group mean,or the mean associated with good adjustment if they are not equivalent. Eysenck found well-adjusted individuals to score slightly higher than the norm on Extroversion (1968).

The psychology class was designed to make students more comfortable and more accepting of themselves and others. The activities involved

group and individual efforts equally; they were not intended to encourage extroverted characteristics more than introverted. The class was therefore not expected to affect them on this dimension of their personalities.

The control group's mean scores (Sept: mean = 15.4, s.d. = 4.12; Jan: mean = 16.0, s.d. = 3.30; June: mean = 15.7, s.d. = 1.97) fall in the 85th percentile of the normative group (Eysenck, 1968). High extroversion scores in this group could be attributed to the fact that it was comprised of volunteers whose participation in the experiment involved only taking psychological tests and being personally interviewed. Relatively more extroverted students would be expected to be volunteers for this type of activity.

Neuroticism

Neuroticism decreased significantly in the SCI/SCI group. The final mean score of 5.0 (s.d. = 3.44) is in the 21st percentile of the normative group, its mean being 10.9 (s.d. = 4.7). According to Eysenck (1968) "average" scores fall between the 31st and 70th percentiles. High neuroticism scores indicate emotional over-responsiveness, difficulty in returning to a calm state after emotional experiences, the tendency to worry, the experience of minor somatic upsets (headaches, insomnia, digestive troubles), and prevalence of anxiety and other disagreeable eomtional feelings. Such individuals, according to Cline (1972) are predisposed to neurotic disorder under stress. Better adjustment and greater emotional stability are reported to be associated with lower neuroticism scores and with middle to above average extroversion scores (Eysenck).

Anxiety has been identified as an aspect of neuroticism (Cattell, 1961). This dimension of the EPI has been related to the anxiety scale of other inventories, including Cattell's IPAT anxiety scale (r = .74). The large part anxiety plays in psychological disorder has been widely acknowledged. It had been found to impair learning (Sarason & Palola, 1960; Meyers & Martin, 1974), and its reduction found to be positively correlated with learning (Mowrer, 1950).

Another aspect of neuroticism according to Cattell (1961), is impairment of function through "exhaustion effects" at a neurophysiological level. Caused by prolonged anxiety and conflict, these exhaustion effects are experienced as losses of psychic energy, inability to concentrate, poor memory, effort intolerance, and increase of errors in performance (p. 10). Thus neuroticism can be assumed to be detrimental to learning, and its reduction to improve it.

Other characteristics of neuroticism are high motor rigidity, poor physical coordination, low field independence (high suggestibility), low fluency, and lack of alertness. The notable decrease in neuroticism among regular meditators in this experiment, together with previous findings of improved perceptual-motor coordination (Blasdell, 1975; Rimol, 1975), reaction time (Appelle & Oswald, 1974); increased field independence (Pelletier, 1974), increased internal locus of control (Hjelle, 1974); increased inner directedness (Seeman, Nidich & Banta, 1972); increased resistance to stress (Orme-Johnson, 1973); improved memory (Abrams, 1975); and reduction of errors in task performance (Miskiman, 1975) suggests that on a neurophysiological level the TM technique counteracts or neutralizes the impact of conflicts,

traumatic experiences, or constitutional weaknesses causing maladjustment, and thereby increases physiological and emotional stability.

Reich (1948), Lowen (1958), Green (1970), and Brown (1974) have emphasized the interrelationship between mental and physiological states. Anxiety, apathy, hostility, and other negative affect states, in this line of thinking, are not solely mental phenomena. Gelhorn (1968; 1972) has found that when the nervous system is in an excitable state of "tuning," the individual is more prone to react to incoming stimuli in an excitable manner. Conversely, if the nervous system is functioning with increasing stability and resilience, the likelihood of a stable response to a widening variety of situations increases. The unusually deep physical relaxation and psychophysiological state of restful alertness produced by the TM technique (Wallace et al., 1971, 1972) may serve to "undo" or release the physiological counterparts of these negative affect states, as well as to strengthen the individual's resistance to stress-producing situations.

Self-concept

The pretest mean for the SCI/SCI group on self-concept was 338 (s.d. = 38.8); the mean score for the normative group of American college students is 345.6 (s.d. = 30.7) (Fitts, 1965). The final posttest mean for the SCI/SCI group was 372 (s.d. = 31.7), which is comparable to the mean of a group characterized as high in personality integration, 376.0 (s.d. = 25.5). The TCSC has also been found to distinguish between psychiatric patients and non-patients, delinquents and non-delinquents, and other groups varying on specified psychological dimensions (Fitts).

According to the author, persons with high self-concept scores tend to like themselves; feel that they are persons of value and worth; have confidence in themselves, and act accordingly. People with low scores doubt their own value; see themselves as undesirable; often feel anxious, depressed, and unhappy; and have little confidence in themselves.

Other studies involving self-concept as a criterion of change have given evidence that people's concepts of self change as a result of significant experiences (Fitts, 1965). These experiences have included counseling, therapy, high-stress training environments, and group training. Since the SCI/SCI class showed a change from a mean considered normal to a mean approaching the high personality integration mean, the SCI course, particularly for the most regularly meditating group, may be considered a significant experience. The psycho-physiological effects of the technique may have resulted in students feeling more relaxed with themselves, more clear in thinking, and consequently more successful in their actions--which could well lead to an improved self-concept.

Other studies on self-concept support this study's finding of a negative correlation between neuroticism and self-concept. Fitts (1965) cites studies in which low self-concept was found to be associated with anxiety, neurosis, and personality disorder. Knapp (1965), comparing the EPI's neuroticism dimension to Shostram's Personal Orientation Inventory (POI), a measure of self-actualization, found negative correlations on all subscales, the highest between Neuroticism and Time Competence. Both self-actualization and positive self-concept

reflect high ego-strength which is considered functionally opposite to neuroticism (Cattell, 1961). Previous self-actualization and personality development studies on adults practicing the TM technique (Nidich, Seeman & Dreskin, 1973; Ferguson & Gowan, 1974; Fehr, et al., 1975) as well as Shecter's findings on high school students (1975) corroborate this study's results on the self-concept measure.

Perceived change

The parameter of perceived change was included in the interview measure to identify any possible perceived differences in student experience of school, family, friends, etc. over the months that would not yet be reflected in the other measuring instruments. The significant interaction found showing variation in differences between groups between January and June suggests that the effects of TM are felt in several areas of life.

Greater increase in perceived change than in perceived effectiveness found among the "beginning" meditators of this study is corroborated by subjective reports of many people who begin the technique: a change or contrast in feelings or behavior is felt before increased effectiveness in life situations becomes apparent. This could be due to the immediate effect of deep relaxation and resulting energy or alertness that the technique seems to produce.

The control group mean decreased over time on this measure. This could be interpreted to indicate that many students fail to subjectively experience positive growth as the school year progresses.

Intelligence

Though subjective reports of the SCI/SCI group on the interview measure indicated a more positive response to school subjects and increased alertness, this was not reflected significantly on the intelligence measure. Possibly affective states are more quickly affected than cognitive states by the TM technique. The degree of increase in physiological efficiency required for improvement in fluid intelligence (Cattell, 1963) may require a longer period (in months) of regular meditation to be reflected on an intelligence measure, particularly with this size sample. The intelligence test used is designed to test crystallized as well as fluid intelligence (Buros, 1965), the former owing more to the individual's learning history than to a general adaptable ability. It may be that the TM technique measurably affects attitudes toward self and surroundings more quickly than complex cognitive skills.

Attributing test results to group differences

Both SCI/SCI and Psych/SCI students volunteered for the same self-development class. There were no entering differences between the two experimental groups except on intelligence. A questionnaire filled out anonymously by the members of both classes at the end of the school year indicated a similar subjective response to both classes, with the Psychology semester of the Psych/SCI class slightly favored. Both classes were considered "special," their approach and activities being unique to that school's curriculum. Therefore the increased gain of the SCI/SCI group compared to the SCI semester of the Psych/SCI group may be attributed to two factors: greater regularity of meditation and greater number of drop-outs.

A number of previous studies on TM (cited earlier) have shown that gains relate to regularity of meditation and length of time period over which a subject has been practicing TM. The fact that the Psych/SCI class was significantly lower than the SCI/SCI class in regularity of meditation, that significant gains in self-concept were made in the Psych/SCI sub-group of regular meditators, and that correlations were found between gains in perceived change and number of meditations per week in the SCI/SCI group, and in self-concept and perceived effectiveness and number of meditations per week in the Psych/SCI group, suggests that the TM technique itself, more than the discussions or activities of the SCI classes, is responsible for the growth effects found in the study. This conclusion is corroborated by Shecter's finding on secondary students taking SCI classes with and without the TM technique: significant gains were found only in the classes which included the technique (1975).

The SCI class ended the school year with 14 subjects, the Psych/SCI with 18. A greater number of students dropped out of the SCI class; it is possible that those receiving the greatest benefit from the class remained. Therefore drop-outs may have produced a more highly selected group of students comprising the SCI/SCI class.

Greater growth effects from the TM technique compared to the psychology self-development course may be due to TM's more direct physiological effects on the individual in the form of deep relaxation and improved functional efficiency. It may more directly and consistently counteract stress and dullness than a psychology class which depends for its positive effects on a number of factors-- the

mood of the teacher and of the student, the success of their interaction, and the proper selection by the teacher of the daily activity. The TM technique, because it reportedly produces predictable effects independent of the particular emotional state or keenness of teacher or student, may be more reliable in bringing about positive changes.

Subjects might be expected to report themselves as feeling better after beginning any self-improvement program. Yet several months' practice could be expected to reduce or eliminate responses based on suggestion or the charm of something new. The subjects in the SCI/SCI group showed continued improvement on neuroticism, self-concept, and perceived change, suggesting an effect of treatment rather than the Hawthorne Effect.

Self-selection is a factor to be considered in generalizing from the results of this study. Because of the large number of drop-outs and the volunteer composition of the class, it would be imprudent to assume, on the basis of this study, that all secondary students taking SCI would experience positive results. However it can more appropriately be concluded that those who elect to take the SCI class and to meditate regularly may expect improvement in the areas indicated in this study.

The effect of the particular teacher on the groups could be considered as a possible explanation for the results. Yet the same teacher taught both classes, and greater gains were found in the SCI/SCI class. The student evaluations of the teacher also indicated that the teacher was not key to the experimental results.

The amount of individual attention from the teacher can improve self-confidence of the students and their performance in class. The psychology semester activities included encouragement and appreciation of the individual students on the part of the teacher; the structure of the class involved personal interaction between teacher and student more consistently than the SCI class. In the SCI class the students were individually taught the TM technique by a trained TM teacher not connected with the school. After the instruction the class was conducted with lectures, discussions, and art and writing activities. The subject matter was the development of individual potential, but the class was not structured to provide for more individual attention than is found in other high school classes. Therefore gains in the SCI/SCI group cannot be reasonably ascribed to greater attention from the teacher.

It is possible that the mutual support provided by a group of individuals all engaged in a special program had a positive effect on the self-concept of the individual participants, leading one to question whether the results found in a group would be found in an isolated student over the same amount of time. Previous research on individuals practicing the technique regularly at home and coming to a central location to be tested indicate that the results are consistent with findings from groups. (All studies cited earlier except for the high school, business, and rehabilitation studies involved individually practicing volunteers.) This suggests that the SCI/SCI class gains were due to the practice rather than to an atmosphere of good feeling and mutual spport.

Summary

This study was undertaken to investigate the psychological effects of a class which included the practice of the TM technique, compared to an alternate self-development class and a comparison group from the same school. Dividing the same large group of volunteers into the two self-development classes allowed for a more reliable assessment of treatment effect apart from self-selection and Hawthorne effects than has been found in previous high school studies on TM. The findings of this study tended to corroborate findings of previous psychological research on the SCI course and the TM technique. The relatively high change on neuroticism, self-concept, and perceived change measures in the SCI/SCI group suggest the possibility of a global effect of the technique. The results support the theory that the restfully alert state produced by TM has a "normalizing" effect on the functioning of mind and body, allowing stress and fatigue to be diminished and restoring greater orderliness and functional integrity to the system.

The success of the educational process depends on the interaction between the student and what is presented to him (teachers, books, facilities, materials). It is becoming increasingly apparent that the psychophysiological state of the student--the degree of alertness, receptivity, flexibility and integartion--largely determines the effectiveness of his education. This study together with previous research gives evidence that the SCI course and specifically the TM technique seem to be a viable means for positively affecting both affective and cognitive development of the individual relatively quickly, without sacrificing development in one area for the other.

TM is a distinctive self-development technique because it is practical, systematically practiced, and yields positive cumulative changes that are measurable. Secondary education has lacked widely applicable methods to directly improve intellectual, emotional, and social functioning. For these reasons, the SCI course bears further, more widespread investigation in the high school environment.

Recommendations for future research on TM

The SCI course for secondary education lends itself for further study for several reasons: the TM technique is easily learned; it doesn't appear to depend for lasting or continuing effects on the classroom instructor; it is non-religious and applicable to any student who elects to take it irrespective of previous educational attainment; it is practiced fifteen minutes twice daily, thus suitable to be integrated into the daily high school schedule; it may be practiced in the classroom; it doesn't bring about abrupt changes in individual feelings or behavior that could disrupt other classwork; and it is the "laboratory" part of an academic course designed for high school.

This study suggests a number of questions that are unanswered by the present data. What results can be expected in high school students by more regular practice of the TM technique? Would similar results be observed in schools representing other ethnic groups and socio-economic levels? Will physiological tests support the psychological findings on secondary students beginning the course? Is regularity of practice of TM the only requirement for predictable growth effects? Would a study over a longer period of time reveal changes in academic

performance and intelligence? Is the SCI course more effective than other physiological techniques for affecting holistic development?

Experimental conditions in future research might include structuring the two fifteen-minute meditation periods during the school day, with attendance required. Most students in this study were found to be sporadic in their practice of the technique at home. Even the individuals considered "regular meditators" rarely meditated fourteen times per week.

To prevent drop-outs a description of the course should be available, including an outline of its academic aspect, so students electing to take it have a clear idea of the nature of the classes. Many drop-outs in this study were due to this misunderstanding.

A design which includes two experimental groups is advised, to more clearly distinguish between Hawthorne effect and treatment effect, and to control for self-selection. Further research, if involving an alternate self-development course changing to the SCI course, may show a quadratic trend in gains over time, one course resulting in distinctly greater growth effects than the other within the same group of subjects.

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APPENDIX A

TABLES AND FIGURES

TABLE 1

Unadjusted group means for experimental and control groups on all measures

Group	Test 1— September M (SD) (N)	Test 2— January M (SD) (N)	Test 3— June M (SD) (N)
	EXTROVERSION		
SCI	13.6 (2.89) (18)	13.3 (3.25) (18)	13.7 (3.43) (14)
Psych/SCI	13.0 (2.56) (20)	14.0 (3.09) (20)	14.2 (2.88) (18)
Control	15.4 (4.12) (23)	16.0 (3.30) (23)	15.7 (1.97) (23)
	NEUROTICISM		
SCI	9.61 (5.04) (18)	7.28 (4.43) (18)	5.0 (3.44) (14)
Psych/SCI	11.6 (5.78) (20)	9.80 (4.76) (20)	9.17 (5.02) (18)
Control	10.04 (5.22) (23)	10.61 (4.92) (23)	9.57 (4.87) (23)
	SELF-CONCEPT		
SCI	338 (38.8) (18)	355 (37.1) (18)	372 (31.7) (14)
Psych/SCI	322 (39.2) (20)	330 (35.0) (20)	338 (39.6) (18)
Control	334 (25.2) (23)	332 (30.7) (23)	343 (33.1) (23)

Note: At January testing (Test 2) Psych students have not yet taken SCI. At June testing Psych/SCI students have been meditating one semester.

TABLE 1 (Continued)

Group	Test 1—September M (SD) (N)	Test 2—January M (SD) (N)	Test 3—June M (SD) (N)
	PERCEIVED EFFECTIVENESS (from Interview)		
SCI	28.8 (4.10) (18)	29.2 (3.67) (18)	30.1 (2.56) (14)
Psych/SCI	26.2 (2.78) (20)	27.4 (3.03) (20)	26.4 (3.01) (18)
Control	28.3 (4.41) (23)	28.6 (4.34) (23)	26.8 (3.37) (23)
	PERCEIVED CHANGE (from Interview)		
SCI	22.6 (1.46) (18)	24.1 (2.31) (18)	26.0 (2.27) (14)
Psych/SCI	21.9 (1.89) (20)	22.1 (1.76) (20)	23.0 (1.19) (18)
Control	23.0 (2.55) (23)	22.3 (1.96) (23)	21.6 (2.66) (23)
	INTELLIGENCE		
SCI	109 (12.5) (18)	116 (11.7) (18)	114 (11.6) (14)
Psych/SCI	94.9 (27.9) (20)	102 (20.7) (20)	109 (21.1) (18)
Control	100 (12.7) (23)	103 (16.3) (23)	109 (14.4) (23)

TABLE 2

Adjusted means of the three groups on all measures for the first and second posttest

Groups		Measures					
		Extrov.	Neurot.	Self-con.	Perc. Eff.	Perc. Ch.	Intellig.
SCI/SCI	Jan.	13.4	7.6	349	28.7	24.1	112
	June	14.2	5.7	365	29.9	25.9	110
Psych/SCI	Jan.	14.5	8.6	339	28.0	22.0	106
	June	14.7	8.2	348	27.1	23.0	112
Control	Jan.	15.3	11.1	329	28.3	22.3	103
	June	14.9	10.1	340	26.5	21.6	110

TABLE 3

Multivariate analysis of covariance with groups, repeated measures, and interactions as independent variables

Source	D.F.	Mean Squares	F	ω^2
Groups	12	--	3.92*	--
Extroversion	2	15.77	3.13	.03
Neuroticism	2	124.97	10.11*	.14
Self-concept	2	3639.26	8.72*	.10
Perc. Effect.	2	32.47	3.67	.05
Perc. Change	2	74.23	16.49*	.22
Intelligence	2	166.65	1.16	.0
Repeated measures	6	--	2.69	
Groups x RM	12	--	1.32	

* $p < .01$

TABLE 4

ANCOVA for groups, test times, and interactions

Measure	Source	D.F.	Mean Squares	F	ω^2
Extroversion	Groups (G)	2	11.70	2.22	.02
	Repeated measures (RM)	1	.63	.12	.00
	G x RM	2	3.18	.60	.00
	Error	109	5.26		
Neuroticism	Groups	2	105.70	7.56*	.10
	Repeated measures	1	28.80	2.06	.02
	G x RM	2	4.55	.33	.00
	Error	109	13.98		
Self-concept	Groups	2	4143.95	9.69*	.11
	Repeated measures	1	3902.64	9.12*	.05
	G x RM	2	88.46	.21	.00
	Error	109	427.71		
Perceived Effectiveness	Groups	2	32.49	3.34	.04
	Repeated measures	1	16.60	1.71	.00
	G x RM	2	18.55	1.91	.02
	Error	109	9.72		
Perceived Change	Groups	2	87.90	19.94*	.24
	Repeated measures	1	8.73	1.98	.01
	G x RM	2	16.68	3.78*	.03
	Error	109	4.41		
Intelligence	Groups	2	175.16	1.10	.00
	Repeated measures	1	529.06	3.33	.01
	G x RM	2	196.76	1.24	.01
	Error	109	159.11		

*$p < .01$

TABLE 5

99% confidence intervals of differences between groups

Variable	Comparison	99% confidence interval
Neuroticism	SCI/SCI vs. control	.14 to 7.76
	SCI/SCI vs. Psych/SCI + control	.17 to 7.11
Self-concept	SCI/SCI vs. control	4.00 to 46.60
	SCI/SCI vs. Psych/SCI	7.30 to 51.70
	SCI/SCI vs. control + Psych/SCI	8.24 to 46.56
Perc. Change	SCI/SCI vs. control	.92 to 5.24
	SCI/SCI vs. Psych/SCI	.21 to 4.71
	SCI/SCI vs. control + Psych/SCI	.82 to 4.72

FIGURE 1

Mean neuroticism scores for the three groups from pretest to second posttest

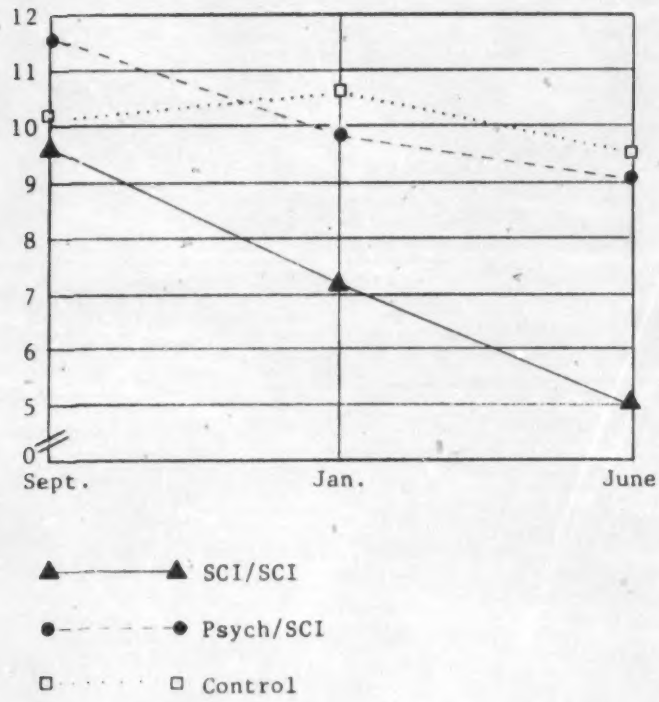

FIGURE 2

Mean self-concept scores for the three groups from pretest to second posttest

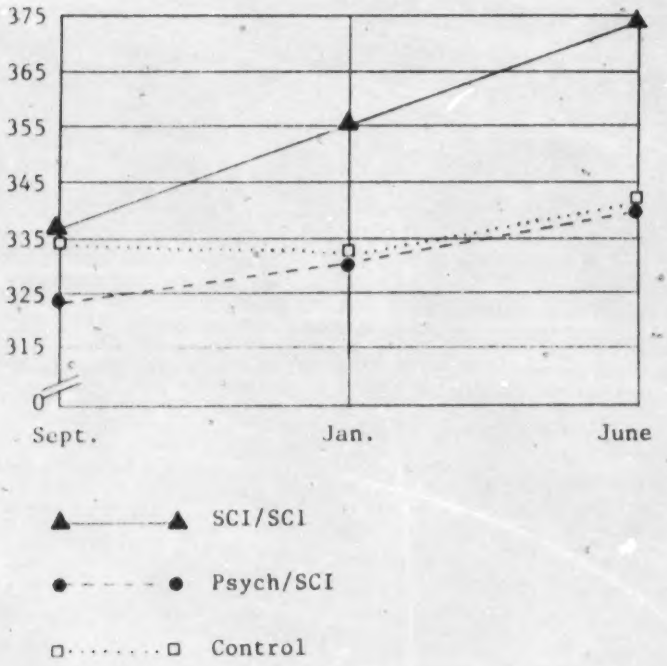

FIGURE 3

Mean perceived change scores for the three groups from pretest to second posttest